CALIFORNIA ENERGY COMMISSION

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April 19, 2007

Ms. Philis Posey Acting Secretary Federal Energy Regulatory Commission 888 First Street NE – Room 1A Washington, DC 20246

Via E-Filing

RE: Klamath Hydroelectric Project (FERC Project No. 2082). California Energy Commission Response to PacifiCorp's Comments on the Klamath Project Alternatives Analysis Model and Consultant Report

Dear Ms. Posey,

On December 1, 2006, California Energy Commission staff provided comments on the Draft Environmental Impact Statement (DEIS) for Federal Energy Regulatory Commission (FERC) Project No. 2082, the Klamath Hydro Project owned by PacifiCorp. As part of the DEIS comments, Energy Commission staff submitted to the FERC National Environmental Policy Act (NEPA) record a consultant report entitled: *Economic Modeling of Relicensing and Decommissioning Options for the Klamath Basin Hydroelectric Project*¹ (Klamath Consultant Report).

On March 12, 2007, PacifiCorp submitted a critique of the *Klamath Consultant Report* to FERC that was prepared by the economics consulting firm Christensen Associates Energy Consulting (CAEC) of Madison, Wisconsin.²

Energy Commission staff has prepared a response to the PacifiCorp critique and submits it to the FERC NEPA record for the Klamath Hydro Project Relicensing Proceeding. The response materials include an *Addendum* to the initial *Klamath Consultant Report* and an updated version of the Klamath Project Alternatives Analysis Model (KPAAM) spreadsheet model entitled KPAAM2. These documents are also available on our website, http://www.energy.ca.gov/klamath, along with other Energy Commission Klamath materials.

¹ Economic Modeling of Relicensing and Decommissioning Options for the Klamath Basin Hydroelectric Project, California Energy Commission Consultant Report, Publication No.700-2006-010, November 2006.

² Evaluation of the Klamath Project Alternatives Analysis Model, Christensen Associates Energy Consulting LLC, Madison, Wisconsin, March 2007.

California Energy Commission Commitment to Transparent Public Proceedings on Energy Matters

As a public energy agency committed to developing the best possible economic and energy analyses to inform the FERC NEPA record for the Klamath Project Relicensing Proceeding, the Energy Commission welcomes public scrutiny and comment on all of its public documents. Such reviews are an integral and vital part of our agency's own public proceedings on energy matters. In this case, they help ensure a transparent public record and help foster public debate on the appropriate methods, assumptions and cost inputs to use on analyses like the *Klamath Consultant Report*.

The PacifiCorp-CAEC critique contains some useful observations and corrections to KPAAM, many of which are incorporated into a revised run of the model. However, the critique also contains many misinterpretations and factual misrepresentations of KPAAM and Klamath Project operations. Many assumptions and cost inputs used in KPAAM are labeled as "errors" by PacifiCorp and its consultant when in fact they are appropriate for the analysis, and represent the best available public data or assumptions used by the government agencies to represent probable mandatory mitigation conditions.

PacifiCorp and its consultant conclude that the *Klamath Consultant Report* contains "biases" and "flaws" that render it unsuitable for "providing an adequate assessment of whether the Klamath Project should be relicensed." These assertions are without merit and not supported by the facts and analyses contained in the PacifiCorp-CAEC critique.

In accordance with our commitment to assist FERC in developing the best possible energy and project economic information for the Klamath Relicensing Proceeding, Energy Commission staff has worked with our consultant M.Cubed and the Department of Interior Office of Policy Analysis to respond to the critique. M.Cubed has incorporated the appropriate revisions identified in the PacifiCorp-CAEC critique into a second run of KPAAM entitled KPAAM2. This *Addendum* to the original *Klamath Consultant Report* Results contains results from KPAAM2 and responses to the PacifiCorp-CAEC critique.

Summary of Key Findings from the Addendum and KPAAM2

Based on the information provided by PacifiCorp and its consultant, KPAAM has been revised and several cost inputs, model formulas and assumptions modified. Results of KPAAM2 are generally consistent with the results of the initial model run, which found that for a broad range of assumptions and replacement power forecasts, it would generally be more cost effective to decommission rather than relicense the Klamath Hydro Project. KPAAM2 results affirm that decommissioning the Klamath Hydro Project and procuring replacement power for 30 years would be less costly to PacifiCorp and its ratepayers than relicensing the project and mitigating its impacts.

Total net present value of the extensive mitigation measures likely to be required to reduce environmental damage from the 169 megawatt (MW) Klamath Hydro Project now range from \$223 to \$415 million, with a midline estimate of \$320 million. Using the information from PacifiCorp's consultant, KPAAM2 shows that economic benefits to PacifiCorp ratepayers from the decommissioning option are higher than originally forecast, and would range from \$32 million to \$286. For the midline case using PacifiCorp's own replacement power forecast, it would be \$114 million less costly to decommission rather than relicense the Klamath Hydro Project.

Energy Commission staff also confirms that the characterizations of the Klamath Hydro Project's operations and energy values presented in the *Klamath Consultant Report* are accurate. The report describes the facility's current operational constraints, low firm capacity values, nominal contributions to PacifiCorp's ability to serve customer load, and the increased future operational constraints from likely relicensing conditions. The report concludes that electricity replacement options for a decommissioning scenario are readily available, and that loss of some or all of the facility's generation would not significantly affect PacifiCorp's ability to serve customer load. These facts are not materially contravened by any information in the PacifiCorp consultant report.

Relicensing with the associated mitigation costs creates the highest risk for PacifiCorp ratepayers. The engineering and scientific issues associated with trying to maintain power production and mitigate impacts are complex and expensive. PacifiCorp's ratepayers will bear the greatest economic risk for unsuccessful mitigation strategies aimed at fisheries and water quality. PacifiCorp shareholders and ratepayers risk not recouping all of the potential costs associated with long-term mitigation and power production, especially if a lower cost, biologically superior project option has been identified in the NEPA record. Ultimately, the Oregon and California Public Utilities Commissions will determine the accurateness of the cost accounting and make final determinations on appropriate cost recovery in their general rate case proceedings.

Energy Commission Perspective on Klamath

At this point in the Klamath Relicensing Proceeding, state and federal fisheries, wildlife and water quality agencies have developed an extensive scientific record documenting the environmental damage to regionally significant populations of imperiled salmonids from historic operation of the Klamath Hydro Project. These scientific findings were confirmed by the trial judge in the administrative hearings conducted pursuant to the Energy Policy Act in August 2006.

Our agency's own investigations into the energy values associated with the project document that this 169 MW hydroelectric facility is a nominal energy resource that contributes a modest two percent to PacifiCorp's total electricity supply. Project operations and dispatch flexibility are highly constrained by Bureau of Reclamation operations, and would be further constrained by the likely mitigation measures imposed by FERC and other agencies. Replacement power for the project's intermittent, non-

firm power is readily available from thermal and renewable resources in the Pacific Northwest. Based on this information, we question the wisdom of investing hundreds of millions in ratepayer money to sustain a nominal and environmentally damaging power plant, especially when lower cost, environmentally superior project alternatives are available.

The opportunity costs for alternative investments of this ratepayer money are substantial. For example, for \$320 million a 170 MW wind farm could be constructed that produces intermittent, emissions-free electricity. For \$350 to \$400 million, developers in California are constructing state-of-the-art 500 MW natural gas-fired combined cycle power plants that meet our state's tough air quality standards and produce firm power with some dispatch flexibility.

FERC's relicensing proceeding for the Klamath Hydro Project presents a unique opportunity to help restore the historically significant runs of salmon and steelhead to the Klamath River Basin. Low power-high environmental impact power plants like Klamath require significant and unique energy benefits to justify their continued operations. Energy policies in California are creating fleets of modern, cost-effective power plants that minimize damage to the environment and maintain electric system reliability, greatly reducing the need for outmoded, environmentally damaging facilities such as the Klamath Hydro Project.

Thank you for the opportunity to provide additional comments on the DEIS for the Klamath Hydroelectric Project. The Energy Commission will continue to provide its energy and economic expertise to FERC and the other state and federal agencies involved with the Klamath Relicensing Proceeding. Please contact Terrence O'Brien, Deputy Director, Energy Facilities Siting Division, at 916-654-3933, or by email at tobrien@energy.state.ca.us, if you have any questions or require further information.

Since

B.B. BLEVINS
Executive Director

CC: Mr. Michael Chrisman

Secretary, California Resources Agency

> Mr. Ryan Broddrick Executive Director, California Department of Fish and Game

Ms. Dorothy Rice Executive Director, California State Water Resources Control Board

Mr. Michael Grainey
Director, Oregon Department of Energy

Mr. Steve Thompson California and Nevada Operations Manager, U.S. Fish and Wildlife Service

Mr. Rodney R. McInnis Regional Administrator, United States Department of Commerce National Oceanic and Atmospheric Administration, National Marine Fisheries Service

Mr. James Lecky
Director, Protected Resources Division, United States Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

Mr. Cory Scott Klamath Relicensing Project Manager, PacifiCorp

Attachments:

Attachment 1: Addendum to Economic Modeling of Relicensing and Decommissioning Options for the Klamath Basin Hydroelectric Project

Attachment 2: KPAAM2 Excel Spreadsheet Model

CONSULTANT REPORT

ECONOMIC MODELING OF RELICENSING AND DECOMMISSIONING OPTIONS FOR THE KLAMATH BASIN HYDROELECTRIC PROJECT

ADDENDUM A

Response to PacifiCorp's Comments on the Klamath Project Alternatives Analysis Model

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California Energy Commission

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CALIFORNIA ENERGY COMMISSION RESPONSE TO PACIFICORP'S COMMENTS ON THE KLAMATH PROJECT ALTERNATIVES ANALYSIS MODEL

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CALIFORNIA ENERGY COMMISSION RESPONSE TO PACIFICORP'S COMMENTS ON THE KLAMATH PROJECT ALTERNATIVES ANALYSIS MODEL

Introduction

On December 1, 2006, California Energy Commission staff provided comments on the Draft Environmental Impact Statement (DEIS) for Federal Energy Regulatory Commission (FERC) Project No. 2082, the Klamath Hydro Project owned by PacifiCorp. As part of the DEIS comments, Energy Commission staff submitted to the FERC National Environmental Policy Act (NEPA) record a consultant report entitled: *Economic Modeling of Relicensing and Decommissioning Options for the Klamath Basin Hydroelectric Project.*¹

The *Klamath Consultant Report* was prepared by the energy economics consulting firm M.Cubed of Davis, California. A key feature of the report was the development and application of an economic spreadsheet modeling tool entitled Klamath Project Alternatives Analysis Model, or KPAAM. The report evaluated two future conditions for the Klamath Hydro Project: Relicensing with agency-required fisheries and water quality mitigation; and Decommissioning with 30-years of replacement power. The study was jointly sponsored by the California Energy Commission and U.S. Department of Interior, Office of Policy Analysis.

On March 12, 2007, PacifiCorp submitted a critique of the *Klamath Consultant Report* to FERC that was prepared by the economics consulting firm Christensen Associates Energy Consulting (CAEC) of Madison, Wisconsin.²

As a public energy agency committed to developing the best possible economic and energy analyses to inform the FERC NEPA record for the Klamath Project Relicensing Proceeding, the Energy Commission welcomes public scrutiny and comment on all of its public documents. Such reviews are an integral and vital part of our agency's own public proceedings on energy matters. In this case, they help ensure a transparent public record and help foster public debate on the appropriate methods, assumptions and cost inputs to use on analyses like the *Klamath Consultant Report*.

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The PacifiCorp-CAEC critique contains some useful observations and corrections to KPAAM, many of which are incorporated into a revised run of the model. However, the critique also contains many misinterpretations and factual misrepresentations of KPAAM and Klamath Project operations. Many assumptions and cost inputs used in KPAAM are labeled as "errors" by PacifiCorp and its consultant when in fact they are appropriate for the analysis, and represent the best available public data or assumptions used by the government agencies for probable mandatory mitigation conditions.

In accordance with our commitment to assist FERC in developing the best possible energy and project economic information for the Klamath Relicensing Proceeding, Energy Commission staff has worked with M.Cubed and the Department of Interior Office of Policy Analysis to respond to the critique. M.Cubed has incorporated the appropriate revisions identified in the PacifiCorp-CAEC critique into a second run of KPAAM entitled KPAAM2. This *Addendum* to the original *Klamath Consultant Report* Results contains results from KPAAM2 and responses to the PacifiCorp-CAEC critique. Energy Commission staff submits this *Addendum* to the FERC NEPA record for the Klamath Hydro Project.

Summary of Addendum Findings

This *Addendum* describes the results of revisions to KPAAM (entitled KPAAM2) based on information provided by PacifiCorp and its consultant. The key findings are that:

- Some cost inputs and model formulas in KPAAM were incorrect and have been revised using appropriate corrections from the PacifiCorp-CAEC critique;
- Based on the revised cost inputs and assumptions for KPAAM2, decommissioning the project, rather than relicensing, increases the economic benefits to PacifiCorp's ratepayers from \$32 million to \$286 million. For the midline case using PacifiCorp's own replacement power forecast, it would be \$114 million less costly to decommission rather than relicense the Klamath Hydro Project;
- The analytic approach, spreadsheet model and key assumptions used in the original Klamath Consultant Report are appropriate for evaluating the two likely future conditions for the Klamath Hydro Project. Although the critique asserts that KPAAM contains "flaws" and "biases," and CAEC concludes that it "does not believe that KPAAM is capable of providing an adequate assessment of whether the Klamath Project should be relicensed," CAEC does not factually dispute the basic structure, approach or key assumptions used in KPAAM, indeed, CAEC's assertions are without merit and not supported by the facts and analyses contained in the PacifiCorp-CAEC critique;

- KPAAM is an appropriate analytic tool and the only model available to the
 public record to objectively and transparently model future conditions for the
 Klamath Hydro Project. The assumptions and inputs used in KPAAM and
 KPAAM2 are conservative, clearly stated, and can be changed to model
 different assumptions, cost inputs, or decommissioning scenarios;
- KPAAM analyzes the four-dam removal scenario because the California
 Department of Fish and Game requested a full removal scenario, based on
 the assumption that this project alternative may provide the best opportunity
 for restoration of Klamath Basin fisheries; and
- Energy Commission and Department of Interior staff confirm the descriptions
 of the Klamath Hydro Project's current operational constraints, low firm
 capacity values, nominal contributions to PacifiCorp's ability to serve
 customer load, increased future operational constraints from likely relicensing
 conditions, and readily available firm electricity replacement options in a
 decommissioning scenario that was presented in the initial Klamath
 Consultant Report. These facts are not materially contravened by any
 information in the PacifiCorp consultant report.

Background to Energy Commission Development of KPAAM

The Klamath River is one of the most important rivers for imperiled populations of Chinook salmon, Coho salmon, and steelhead trout on the West Coast of the United States. PacifiCorp's 169-megawatt (MW) Klamath Hydroelectric Project is a nominal energy resource and major contributor to the loss of salmon from more than 300 miles of habitat in the upper Klamath Basin. Due to the significance of the Klamath Basin salmon fisheries and the river's unique restoration potential, the Energy Commission determined that it was appropriate to contribute its substantial energy and economics expertise to the state and federal environmental regulatory agencies engaged in the FERC relicensing proceeding. The California Energy Commission is California's lead energy agency, and provides information, analysis and policy recommendations on energy issues to the Governor, Legislature, stakeholders and general public.

In its 2003 Preliminary Assessment of the Klamath Hydro Project³, Energy Commission staff characterized the Klamath Hydro Project as a low power – high impact energy facility that causes disproportionate environmental damage relative to the size and value of its electricity generation. The Klamath Consultant Report showed that decommissioning the project and replacing its electricity from other sources is generally more cost effective than relicensing the project and installing

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³ Preliminary Assessment of Energy Issues Associated with the Klamath Hydroelectric Project, California Energy Commission Staff Report, Publication No. 700-03-007, May 2003.

fish ladders and water quality improvement devices necessary to meet the minimum science-based legal requirements.

The government agencies developed a rigorous and transparent economic model, KPAAM, to provide the parties involved with relicensing and settlement negotiations the best possible analysis of the economic pros and cons of the relicensing and decommissioning options. Dr. Richard McCann of M.Cubed, a well qualified and highly regarded energy economics firm, ⁴ prepared the model and report. The study uses standard economic analysis methods and the best available public data in a broad range of technical areas - including mitigation costs, operational and investment costs, risk factors and power forecasts. Because PacifiCorp declined to contribute to the modeling work with specific, relevant inputs or assumptions, much of the data was drawn from PacifiCorp's own certified filings with FERC and filings and attestations before the Public Utilities Commissions in Oregon and California.

KPAAM is the only comprehensive, objective and transparent assessment tool that analyzes the cost differences between two distinct future project alternatives. The first option is to decommission the four hydroelectric dams (Copco 1 and 2, Irongate and JC Boyle), purchase replacement power over a 30-year license period and restore the Klamath Basin salmon fisheries. The second option is to relicense the four dams with full mitigation measures. KPAAM is intended to provide an analytic platform that can be used to examine the complete economics of a hydroelectric facility and identify the optimal benefits for all stakeholders – PacifiCorp's ratepayers and shareholders, farmers, tribes, salmon fishermen, salmon and the public.

KPAAM was designed as a tool for public discourse and clearly states that the inputs can and should be changed to reflect different assumptions or accommodate new information as it becomes available. The analysis was not intended to provide a "precise" forecast, instead offering a range of plausible economic outcomes. The appropriate interpretation of the initial KPAAM results, now bolstered by the KPAAM2 results, is that over a broad range of assumptions on mitigation costs, decommissioning costs and replacement power costs, it is generally cheaper to decommission the Klamath project and procure replacement power for 30 years than it would be to relicense the project and pay for the extensive measures needed to mitigate its environmental damage to Klamath River fisheries and water quality.

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⁴ The U.S. Bureau of Reclamation's Technical Services Center prepared the hydrological model for KPAAM.

Summary of Principal Findings from the Initial Klamath Consultant Report

Current Klamath Electricity Production Profile

- The Klamath Hydro Project is a 169 MW nameplate capacity project with annual average generation of about 716 gigawatt-hours (GWh).⁵ FERC rates its dependable capacity at 42.7 MW,⁶ while the Pacific Northwest Power Planning Council (NWPPC) rates firm winter capacity at 92 MW.
- Project operations are highly constrained by Bureau of Reclamation control of inflows to Keno Dam. Water releases from Upper Klamath Lake are prioritized to meet irrigation needs and Biological Opinion flow schedules and volumes to enhance aquatic habitat for endangered salmonids below the Klamath Hydro Project. These constraints and the lack of pondage available to PacifiCorp render the project more as a run-of-river facility than a classic peaking facility that can be dispatched to meet customer load and peak demands. PacifiCorp's filings to the California Public Utilities Commission (CPUC) affirm that the Klamath Hydro Project is dispatched primarily to displace higher cost fossil resources as inflows are available, rather than to meet custom load or peak demand.

Costs and Energy Effects of Likely Relicensing Mitigation

- Imposing probable agency-required Relicensing Conditions reduces baseline generation 23 percent to 562.8 GWh. Reduced ramping rates and increased instream flows further constrain project flexibility to operate in a peaking dispatch mode.
- Total net present value (NPV) mitigation costs for 160 probable agency-required mitigation measures for full volitional fish passage, water quality improvements and other mitigation measures range from \$230 to \$470 million, with a midline estimate of \$360 million.⁷ These costs represent conservative assumptions and include *only* the mitigation measures that Federal and State resource agencies can require with their legal authorities. It was further assumed that FERC would reject all Federal and State resource agency recommendations, and that FERC would not add any additional requirements.⁸

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⁵ This amount varies with the time period used and the physical configuration and regulations assumed in place.

⁶ Reference citations from the *Klamath Consultant Report* are not repeated in this *Addendum*. Please refer to the initial Report for all reference citations.

⁷ Summaries of the KPAAM financial results are presented for historic reference and are superseded by the KPAAM2 results presented in this *Addendum*.

⁸ The Department of Interior is not aware of any relicensing proceeding where FERC rejected all agency recommendations and did not add any of its own requirements.

Costs for Four-Dam Decommissioning Scenario and Replacement Power

- Total NPV decommissioning costs would range from \$77 to \$110 million, with a midline estimate of \$94 million.
- Replacement power cost estimates were developed using six publicly available forecasts reflecting a range of assumptions and energy resources.
 Total NPV replacement power costs for an assumed 30-year period would range from \$74 to \$167 million.
- Total decommissioning and replacement power costs ranged from \$152 to \$277 million.

Comparison of Mitigated Relicensing and Decommissioning with Replacement Power Cases

- The NPV cost differences to ratepayers between Relicensing with mitigation and Decommissioning with 30 years of replacement power ranged from a cost of \$14 million to a benefit of \$285 million. For 16 of 18 cases, it would be cheaper to decommission rather than relicense.⁹
- For the midline case using PacifiCorp's 2005 power cost estimate, it would be \$101 million less costly for ratepayers to decommission the project and procure replacement power for 30 years rather than relicense the project with the full suite of mitigation measures likely to be required by environmental regulatory agencies.
- Loss of the Klamath Hydro Project's production would not have a
 demonstrably significant effect on resource adequacy. Replacement power
 for the intermittent, low capacity value Klamath hydroelectricity is readily
 available in the Pacific Northwest.¹⁰ PacifiCorp's filings to FERC indicate that
 \$5.6 million in transmission improvements would allow sufficient replacement
 power to be brought in from the grid.

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⁹ Mitigation would be economically justified *only* if *all* required mitigation costs were at the low end of the range (approximately 36 percent less than the mid-line estimate) *and* FERC *rejected all* Federal and State recommendations *and* FERC added no mitigations requirements of its own *and* decommissioning costs were at the high and of the range (about 15 percent more than the mid-line estimate, and 30 percent more than the initial engineering estimate) *and* replacement power costs were at the top of the cost range (more than double current prices).

¹⁰ The Oregon Public Utility Commission recently declined permission for PacifiCorp to build new capacity beyond what was already in their resource plan, citing adequacy of existing capacity in the Pacific Northwest.

Review of PacifiCorp-Christensen Associates' Critique

PacifiCorp retained Christensen Associates Energy Consulting, LLC, to review the KPAAM. CAEC contended that it found a "number of flaws" and in their judgment determined that KPAAM is not "capable of providing an adequate assessment of whether the Klamath Project should be relicensed."¹¹

This assertion that the model is not credible is not supported by the information presented in the CAEC report. PacifiCorp's consultants did not fault the fundamental principles and structure of KPAAM. The staffs of both the Energy Commission and the Department of the Interior agree that the CAEC review supports KPAAM as a rigorous, flexible and well-designed model that is appropriate as the primary economic analytic tool for the Klamath project. The KPAAM is the only economic analysis model that has been developed and made available to all parties in the settlement negotiations and relicensing proceedings.

CAEC did not criticize the model's basic principle that "options should be evaluated when directly comparing relicensing to decommissioning." As stated in the *Klamath Consultant Report*, PacifiCorp must invest substantially in either mitigation or decommissioning to bring the Klamath operations into compliance with State and Federal environmental requirements. The FERC license expired March 2006 for this facility and status quo operations will end when a new license is issued. ¹²

More importantly, the CAEC critique makes a stronger case for decommissioning when their data is used in the KPAAM model.

CAEC identified 14 "errors" that can be sorted into four categories:

- 1. Input and logic flow errors due to the complexity of data and model.
- 2. Data inputs incorrectly labeled by CAEC as "errors" when the "best available public data" was used because PacifiCorp did not share or disclose the necessary information.
- 3. Incorrect changes by CAEC to the original KPAAM assumptions and inputs that remain unchanged because they are accurate.
- Differences in professional practices between CAEC and California and Federal government economists and analysts that result in differing perspectives.

¹¹ These assertions are repeated in PacifiCorp's April 5, 2007 filing to FERC concerning the 10(j) meeting between PacifiCorp and U.S. Fish and Wildlife Service. In the filing, PacifiCorp seeks to discredit use of the Energy Commission *Klamath Consultant Report* by the Service.

¹² PacifiCorp is currently operating the Klamath Project on an annual FERC license extension using the old license conditions – which are not consistent with current State and Federal requirements – until a decision is made by FERC.

CAEC undermines its own credibility as an objective energy economics firm by confounding the errors in category 1 with the legitimate inputs and assumptions in categories 2 through 4 that CAEC labeled as errors when they clearly are not. It was particularly inappropriate of CAEC to label as "errors" the legitimate, differing views of PacifiCorp and the government agencies on appropriate mitigation measures and their relative costs (See the Point-by-Point Response section of this *Addendum*).

CAEC argues that with their corrections to KPAAM, relicensing the Klamath Hydro Project would cost \$46 million less than decommissioning (using the assumptions for the midline case and PacifiCorp's 2005 power forecast). This nearly \$150 million difference from the initial KPAAM results – which indicated that relicensing would be \$101 million **more** expensive than decommissioning – cannot be duplicated or explained with the information available in the CAEC report.

Putting Risk and Costs in the Proper Context

The PacifiCorp-CAEC critique raised several policy-level issues about potential risks to PacifiCorp ratepayers, shareholders and the natural resources within the Klamath Basin should the findings and conclusions from the Klamath Consultant Report be used by FERC to make a regulatory decision about relicensing. Energy Commission and Department of Interior staff responds to these broad concerns about relative levels of risk.

Relicensing with the associated mitigation costs creates the highest risk for PacifiCorp ratepayers. The engineering and scientific issues associated with trying to maintain power production and mitigate impacts are complex and expensive, especially for small facilities like Klamath which have low levels of power production and high, adverse levels of environmental impacts. The Klamath Consultant Report finds that mitigation to stop and begin reversing the environmental damage from the Klamath hydroelectric operations will cost between \$230 and \$470 million (revised to \$223 to \$415 million in KPAAM2), power production will be reduced by 23 percent, and the project will be unable to provide quick power during peak periods of electricity demand. The PacifiCorp ratepayers will bear the greatest economic risk for unsuccessful mitigation strategies aimed at fisheries and water quality. PacifiCorp shareholders and ratepayers risk not recouping all of the potential costs associated with long-term mitigation and power production. Ultimately, the Oregon and California Public Utilities Commissions will determine the accurateness of the cost accounting and make final determinations on appropriate cost recovery in their general rate case proceedings.

The opportunity costs for alternative investments of the hundreds of millions that PacifiCorp would need to spend to mitigate the 169 MW Klamath Hydro Project and bring it into conformance with modern regulatory standards need to be considered. The revised KPAAM2 relicensing mitigation cost estimate ranges from \$223 to \$415

million NPV, with a midline estimate of \$320 million. Examples of alternative investments for this mitigation money include:

- A new 500 MW natural gas-fired, combined cycle power plant that meets all State of California air quality standards could be constructed for \$350 to \$400 million. Such a facility would have 500 MW of firm capacity, a minimum 30-year design life, and offer some flexibility for dispatch and duty cycle options;
- A 170 MW wind farm could be constructed for \$320 million, assuming installed costs of \$1.9 million per MW;
- The Oregon Department of Energy's Klamath Hydro Project replacement power option includes 30 MW of demand-side management measures (DSM) and a 30 MW biomass plant located in the Klamath Basin, which would provide about 700 GWh annually at a melded cost of about \$350 million.

Cost is just one of the parameters used by the FERC and the regulatory agencies to determine the best possible outcome for the endangered salmon fisheries, tribes, salmon fishermen, basin farmers, and PacifiCorp ratepayers. The correct interpretation of the *Klamath Consultant Report* is that within a wide range of power cost estimates and mitigation estimates, it would be less costly to decommission than to relicense. To account for uncertainty and the need for ongoing refinement of potential relicensing and decommissioning costs, the *Klamath Consultant Report* includes an error range of plus or minus 30 percent. The resulting range of the cost differences - from low to high - is nearly \$300 million over a 30-year study period. The changes recommended by the CAEC, and the CAEC contention that their results using the corrections are correct, are well within this error range and do not alter the overall conclusion that decommissioning costs are lower than relicensing costs.

PacifiCorp asserts that KPAAM ignores significant additional risks associated with decommissioning and securing replacement power, including: 1) risk of removing an emissions-free generating resource in an era of increasing regulatory scrutiny on greenhouse gas emissions, 2) unknown costs of sediment removal and mitigation (including sediment management); and 3) possible ongoing legal liability related to unexpected outcomes of removal.

1) Risks of Greenhouse Gas Emissions and Replacement Power

Decommissioning the Klamath project will require PacifiCorp to find replacement power. The 169 MW Klamath project represents about two percent of PacifiCorp's total installed capacity, less than 0.5 percent of its dependable capacity, and about one percent of PacifiCorp's average electricity production. Electricity generated from PacifiCorp's 6,585 megawatts (MW) of coal accounts for 78 percent of PacifiCorp's generating capacity and 68 percent of its total power production.

Replacing electricity from the Klamath Project can be done without increasing greenhouse gas emissions, while allowing for the restoration of a significant salmon fishery. The *KPAAM Consultant Report* includes a carbon neutral energy replacement option – the Oregon Department of Energy (DOE) proposal for 30 MW of energy efficiency and 30 MW of biomass – at an estimated cost below the cost of natural gas power plant replacement options. Other carbon-neutral replacement power options, especially wind power, are viable, but have not yet been examined in the KPAAM model runs.¹³

2) Risks of Dam Removal

PacifiCorp alleges the KPAAM does not account for financial risks associated with dam removal, sediment management and site restoration. This is not correct. The *KPAAM Consultant Report* relies on *Klamath River Sediment and Dam Investigation*. The report concludes that the toxicity of the sediment is low and will not affect the method or cost of dam removal, and that downstream erosion of sediment is a feasible method of sediment management under a dam removal scenario. The same consultant to the California Coastal Conservancy has done similar engineering studies for other dam decommissioning projects in the Pacific Northwest. Energy Commission staff is not aware of any documented engineering analysis that contradicts these results.

3) Risks of Legal Liabilities

PacifiCorp is correct that KPAAM does not quantify potential legal liabilities for the decommissioning scenario. The model makes no representations about potential legal liabilities for either the decommissioning or relicensing scenario. Both scenarios entail some risk of legal liabilities; for relicensing these would include the Clean Water Act TMDL process, dam safety, the potential for additional species to be listed under the Endangered Species Act and other legislation.

¹³ PacifiCorp and CAEC are selectively introducing a new environmental parameter when they raise the issue of GHG emission offset or credit costs for replacement power. First, long-term forward price curves incorporating appropriate ranges of potential offset costs have not yet been created. Second, PacifiCorp and CAEC attempt to create another "error" in KPAAM where none exists. The *Klamath Consultant Report* clearly states that KPAAM uses a cost-effectiveness modeling approach, not a cost-benefit approach. Assessing and monetizing the potential environmental effects of incremental increases in GHGs from thermal replacement power, or quantifying the benefits of retaining Klamath from avoided GHG emissions, can only be done in a comprehensive cost-benefit study that identifies, quantifies and monetizes all of the environmental parameters affected by the Klamath Project, including restoration of fishery runs and other ecosystem consequences. That is part of a much larger analysis than prepared in the Klamath *Consultant Report*.

¹⁴ Klamath River Sediment and Dam Investigation, Gathard Engineering, November 2006, submitted to the FERC record by the California Coastal Conservancy.

Results of Revised KPAAM and Analysis Based on CAEC Inputs

The model inputs were revised and the appropriate corrections from CAEC used. The results reconfirm and strengthen staff's original results: based on the new inputs and assumptions, decommissioning the project rather than relicensing it **increases** the economic benefits to ratepayers from a range of \$32 million to \$286 million. In the original *KPAAM Consultant Report* the difference between decommissioning and relicensing ranged from a cost of \$14 million to an economic benefit of \$285 million. For the revised midline case using PacifiCorp's 2005 power cost forecast, decommissioning would now be \$114 million less expensive than relicensing, a savings of \$13 million more than suggested in the original *Klamath Consultant Report*.

The following tables from the *Klamath Consultant Report* have been revised using the appropriate corrections and changes in assumptions identified in the CAEC report. The revised KPAAM model run incorporates about half of the recommendations from CAEC. The remainders are not used because they are incorrect or reflect differences in perspective between PacifiCorp and the government agencies. Please refer to the *Klamath Consultant Report* for full explanations of methods, data and results.

Revised Table ES-1 shows the new ranges in total mitigation costs, from \$223 to \$415 million, with a midline estimate of \$320 million. This is somewhat lower than the original range in KPAAM of \$230 to \$470 million, and a \$360 million midline. On a megawatt-hour (MWh) basis, the estimated \$41.78 per MWh increase in Klamath electricity production costs is somewhat lower than the initial estimated midline increase of \$47 per MWh. Revised total production costs for Klamath are estimated to be \$60.78 per MWh for the midline case, with a range of \$48.12 to \$73.19 per MWh.

REVISED TABLE ES-1 Net Present Values of Klamath Relicensing Mitigation Costs (Millions of 2006 Dollars)			
	Low	Midline	High
Fish Passage	\$164	\$235	\$305
Nonfish Passage	\$14	\$20	\$26
Water Quality	\$45	\$65	\$84
Total	\$223	\$320	\$415

The fish passage mitigation includes the costs of full volitional upstream and downstream fish passage across the four Klamath power dams (Boyle, Copco's I and 2, and Iron Gate). Note that the water quality estimates may be low due to serious, unresolved water quality issues and the presence of toxic algae in the project reservoirs.

Revised Table ES-2 shows total net present values (NPV) for decommissioning cost estimates, 30 years of replacement power for each of the six replacement power price forecasts used in KPAAM, and the combined replacement power plus decommissioning costs. The ranges in mitigation costs are shown at the bottom of the table for reference.

REVISED TABLE ES-2 Total NPV Costs of Decommissioning: Dam Removal plus Replacement Power (Millions of 2006 Dollars)					
Total Decommissioning Costs		Low	Midline	High	
		\$38	\$55	\$71	
Replacement Power Cost	30-Year Total Replacement	•	ent Power moval Cos	•	
Forecast	Power Costs	Low	Midline	High	
US Department of Interior (DOI)	\$58	\$96	\$113	\$129	
US DOI-PacifiCorp+Energy Information Agency	\$83	\$121	\$138	\$154	
Northwest Power Planning Council 5th Power Plan	\$106	\$144	\$161	\$177	
Oregon Dept of Energy	\$111	\$149	\$166	\$182	
PacifiCorp 2005 Filing with Oregon PUC	\$151	\$189	\$206	\$222	
California Public Utilities Commission MPR	\$153	\$191	\$208	\$224	
Relicensing Mitigation	\$223	\$320	\$415		

Decommissioning cost estimates are now lower than for the original KPAAM model run because the remaining book value of \$38.5 million (the non-recovered, non-depreciated capital investment due shareholders) has been removed at CAEC's recommendation. When combined with other changes, this reduces the net present value decommissioning cost estimate to \$55 million from \$94 million. The nominal dollar cost estimate developed by the California Coastal Conservancy and its consultant to remove the four power dams is about \$90 million.

Thirty-year replacement power cost estimates for the six price forecasts used in KPAAM are moderately lower due to changes in discounting for the forecasts. The range in decommissioning and replacement power costs are now about \$50 million lower than the original KPAAM results, ranging from the low decommissioning-low replacement power cost scenario of \$96 million to the high decommissioning-high replacement power cost scenario of \$224 million. For the midline case using PacifiCorp's 2005 power forecast, total decommissioning costs are estimated to be \$206 million, \$53 million less than the initial KPAAM results.

The only scenario where relicensing with mitigation might be equal in cost to decommissioning with replacement power is when the lowest possible estimate for mitigation costs (\$223 million, which assumes mitigation costs 30 percent below the mid-line estimate combined with the conservative assumption that FERC rejects all Federal and State mitigation recommendations and adds none of its own) is compared to the highest possible cost to decommission Klamath and replace its power (\$224 million, which assumes decommissioning costs at 30 percent above the mid-line estimate, and replacement power costs rising to 3 times their current value).

The revised Table ES-3 from the *Klamath Consultant Report* shows the net benefits of decommissioning compared to relicensing, or the total cost differences between the two project options. Another way to interpret the table is to imagine "A - B = C," where A is the cost of relicensing with mitigation shown in Table ES-1, B is the cost of decommissioning with 30 years of replacement power shown in Table ES-2, and C is the net difference between the two project options. Table ES-3 shows the C values.

REVISED TABLE ES-3

Net Differences Between Relicensing with Mitigation Costs and
Decommissioning plus Replacement Power Costs
Power Forecast Scenarios, Mitigation Estimates and Decommissioning Cost Estimates
(Millions of 2006 Dollars)

	Net Present Value (\$MM)		
Power Price Forecasts	Low	Midline	High
US Department of Interior (DOI)	\$127	\$207	\$286
US DOI-PacifiCorp+Energy Information Agency	\$102	\$182	\$261
Northwest Power Planning Council 5th Power Plan	\$79	\$159	\$238
Oregon Department of Energy – Biomass + DSM	\$74	\$154	\$233
PacifiCorp 2005 Filing with Oregon PUC*	\$34	\$114	\$193
California Public Utilities Commission MPR*	\$32	\$112	\$191

^{*} Costs are for new combined-cycle power plant.

All values are positive, indicating that decommissioning and procuring replacement power for 30 years provides **greater** net benefits to PacifiCorp ratepayers than relicensing with mitigation. In the initial KPAAM, results ranged from a cost to ratepayers of \$14 million, to a benefit to ratepayers of \$285 million. Using the revised data, the net savings from the decommissioning option range from \$32 to \$286 million. For the midline revised case, using PacifiCorp's 2005 power forecast, decommissioning would be \$114 million **less costly** than relicensing with mitigation - \$13 million more than in the original KPAAM results.

Point-by-Point Response to Christensen Associates' Review

The KPAAM is the only transparent, comprehensive, objective and reproducible analysis in this proceeding that provides a full economic comparison of the relicensing and mitigation options for the Klamath hydro project. The model is a flexible analytical tool¹⁵ to inform stakeholders; the results in the *Klamath Consultant Report* were never intended to be the final word on this assessment. The assumptions and inputs are transparent, using publicly available information, including project-specific information provided under attestation, so each party can have access to the complete set of data and assess almost every single aspect of the model.¹⁶

Again, it is important to note that CAEC did not criticize the basic premise of the model - "options should be evaluated when directly comparing relicensing to decommissioning." The CAEC report contains no criticisms of the relationships between cost components, therefore apparently endorsing the general approach used in KPAAM.

KPAAM was never intended to provide a "precise" future forecast because no such forecast is possible. For this reason several known simplifications were made and a range of plausible outcomes were presented. It is the general direction of these outcomes and identification of potential risks that are the key findings from KPAAM, not specific dollar amounts.

Although CAEC correctly identifies a series of input errors in KPAAM that have been corrected in KPAAM2, CAEC diminishes the objectivity of its "independent review"

The following is a point-by-point response to CAEC's findings:

the government-sponsored KPAAM study as "errors."

Basin Hydroelectric Project, December 2006, p.10).

Mitigation Costs

by its reliance on PacifiCorp staff for guidance on how to interpret several mitigation cost items used in KPAAM (Page 8). On many line items, PacifiCorp simply seeks to substitute its preferred proposals for mitigation and label the assumptions used by

estimates. Current costs and conditions are estimated in the model to provide a basis for the relicensing and decommissioning cases." (Economic Modeling of Relicensing and Decommissioning Options for the Klamath

^{15 &}quot;The alternative futures for the Klamath Hydro Project are evaluated and compared using an Excel spreadsheet-modeling platform named Klamath Project Alternatives Analysis Model (KPAAM). The model integrates hydrologic simulations from current and future operational and decommissioning scenarios, future generation levels under numerous operational scenarios, cost inputs for comprehensive mitigation should the project remain in place, decommissioning cost estimates, and replacement power cost estimates from a range of publicly available wholesale price forecasts. The primary model outputs are cost comparisons of the relicensing and decommissioning cases across a range of mitigation cost estimates and a range of replacement power cost

¹⁶ In some cases where CAEC felt the model was not clear, particularly on the power price forecasts, CAEC simply failed to pursue the appropriate references.

- Discount rate for mitigation costs (Page 7) The discounting on O&M costs is corrected. The PV method is correct. These two changes reduce relicensing costs about \$25 million.
- Present value calculation for mitigation costs (Page 7) PacifiCorp's number is now used in KPAAM.
- Water quality mitigation scenario (Page 7) This was an artifact of a sensitivity case used in model development and testing and inadvertently retained in the final version of the model. It has been removed.
- O&M costs over time (Page 8) -- How the duration of the measures was addressed has been corrected.
- Data entry errors and inclusion of duplicative costs (Pages 8-11) These are not errors but unresolved issues between PacifiCorp and the regulatory agencies regarding proposed relicensing mitigation measures. It is misleading and disingenuous for PacifiCorp and CAEC to label as "errors" cost inputs used in KPAAM that were pulled from the available public record that was largely provided by PacifiCorp, itself, under attestation, and that represents the government conclusions on appropriate mitigation. KPAAM is structured so that PacifiCorp may run its own assumptions about these apparent costs. Following are additional line items that illustrate how PacifiCorp-CAEC misconstrued mitigation cost inputs:
 - O JC Boyle Dam Upstream Fishway: CAEC suggests that O&M on a new ladder is duplicative of O&M on the existing ladder. This cost is retained in KPAAM2, since: (1) The O&M on the new ladder in KPAAM comes from PacifiCorp's engineering cost analysis; (2) The relicensed case properly includes O&M on the new ladder, not O&M on the old ladder.
 - JC Boyle Consultation with BLM: The costs are appropriately included in the relicensing case, as they are elements of the BLM's 4(e) conditions.
 The category label should read "Administrative," not "Decommissioning."
 - Copco 2 Temperature Control Device: This item should be listed under Copco 1, not Copco 2. However, the cost estimates are appropriate, and are retained in KPAAM2. The estimates in KPAAM are from PacifiCorp's report titled "Conceptual Design and Screening of Temperature Control Alternatives" dated August 1, 2005, which was prepared in response to a request from FERC for conceptual designs and costs of alternative temperature control structures and oxygenation measures that could be installed at Iron Gate and Copco 1 dams to address temperature and dissolved oxygen conditions within thresholds.
 - Iron Gate Hatchery Operations: Hatchery operations are properly included in the relicensing case, as hatchery operations would continue through the term of the new license. Note as well that the premise of KPAAM is to

- compare two future conditions, not conduct an incremental analysis of differences between current and future operating costs at for the Klamath Hydro Project.
- Upstream Fishway at Keno and Keno Spillway: Keno was part of the fishway prescriptions issued by FWS and NMFS. The O&M cost estimate in KPAAM was correctly taken from the April 22, 2006 CH2MHill cost estimate. PacifiCorp's proposal to remove Keno from the Klamath Project FERC boundary is a proposal, presumably to avoid environmental mitigation costs at this site, which is not a likely outcome.

Incorporating the appropriate changes to the mitigation costs reduces the initial KPAAM results by about \$33 million for the middle case, rather than \$80 million as suggested by CAEC.

Conservative Assumptions for the Relicensing Case

It is important to remember that the relicensing scenario represents a conservative "midline case" based on engineering cost estimates for probable license measures. For example:

- FERC may impose lower cost alternatives under the Federal Power Act Sections 4(e) and 18 than are specified by federal agencies. However, significantly more costly measures may be required by California and Oregon water quality agencies under the Clean Water Act Section 401. The relicensing case did not include measures to address, for example, toxic algae, which is becoming a serious water quality problem in the Klamath project reservoirs.
- The relicensing scenario only uses flow restrictions for the JC Boyle power plant.
 While fewer restrictions could be imposed at Boyle, it is also possible (and indeed likely) that FERC will add flow restrictions at Copco 1 and 2 and Iron Gate Dam that would be based on agency fish and wildlife recommendations.
- The relicensing case did not include most of the mitigation measures
 recommended to FERC by the state and federal fish and wildlife agencies under
 Section 10(j) of the Federal Power Act. It is likely that the license will include
 more, rather than fewer, of these measures, based on the record currently before
 FERC regarding project impacts to fish and wildlife resources.
- The relicensing scenario does not include reasonable and prudent measures that may be required through the Endangered Species Act for threatened Coho salmon. As with CWA 401, that regulatory process comes later, and it is not possible to currently predict what might result beyond fish passage measures.
- The relicensing scenario does not include the necessary maintenance and upgrade costs to keep the power plants running because PacifiCorp has not

provided this information. PacifiCorp told FERC in the final license application that generator rewinds and runner replacements would be required for the various power plants over the next license term, but did not include cost estimates or a schedule for those necessary maintenance operations.

Operational and Investment Costs (Pages 12-13)

- Ongoing O&M costs This was a coding error now corrected in KPAAM.
 However, correcting this omission adds about \$29 million to relicensing costs.
 The impacts asserted by CAEC cannot be duplicated.
- Remaining book value CAEC is correct in treating this as a sunk cost that should be ignored (Klamath Consultant Report, Page 38). It was only included because of PacifiCorp's insistence on compensation. Removing the remaining book value decreases the cost for decommissioning by \$39 million.
- Ongoing capital costs for relicensing This is not a model flaw or error but rather
 an identification of a future data requirement. This data is currently unavailable
 and the data gap can only be filled with PacifiCorp's cooperation. Consideration
 of such costs would further increase the cost of relicensing and reinforce the
 conclusion that decommissioning represents the least-cost solution for PacifiCorp
 and its ratepayers.
- Ongoing decommissioning monitoring and mitigation This is not a model flaw or error but rather a failure by CAEC to carefully review the documentation provided in the Klamath Consultant Report. As noted, the Gathard Engineering sediment and decommissioning study provides cost elements for site mitigation.

Power Forecasts (Pages 13-16)

 Documentation of electricity price forecasts - Sufficient documentation for each of these forecasts is contained in the referenced documents. It appears that CAEC simply failed to review the relicensing docket and the underlying referenced price forecasts, such as the PacifiCorp forecast using the Energy Information Administration forecast and the CPUC's Market Price Referent (MPR). For example, CAEC did not use the gas price forecast from the MPR Excel model as expected; instead they relied only on the outdated CPUC Resolution document.

It has never been the intention of the authors of this report to express an opinion on the relative suitability of each power forecast used in the KPAAM. Instead the range is provided to show the opinions regarding potential futures course. Given that these price forecasts are built on deep uncertainty for which probabilities cannot be assigned, it is not possible to weigh the forecasts for use in this context.

Two noteworthy forecasts:

- The Oregon DOE price forecast for a combined energy efficiency program and biomass power plant is presented in the *Klamath Consultant Report* as it was presented to the modeling team by Oregon DOE's consultants. It represents an equally plausible future and deserves equal weight. The Oregon DOE price forecast is also an important carbon neutral replacement power option.
- The Energy Commission's Preliminary Forecast was inappropriately included in the previously released version of KPAAM. It was an artifact from an early test version of the model and has been removed.
- Replacement power prices The discount rates have been corrected to be
 consistent with the basis of each forecast type (real or nominal). The prices are
 calculated in a recognized simplified manner to eliminate added model
 complexity that would have provided no meaningful precision to the results. In
 addition, CAEC proposes to extend the power price forecasts by creating fictional
 forecasts. This assumption is considered an inappropriate answer to the
 problem of addressing "end point" effects in the model. KPAAM presents an
 appropriate and economically sound means of addressing this problem.

Flow Levels and Additional Modeling Factors (Pages 16-19)

- Water flow calibration PacifiCorp declined to provide stream flow data that
 would have allowed more detailed modeling of these flows. KPAAM relies on a
 model that is a simplification of the Project, but reflects what is believed to be a
 reasonable and accurate interpretation of the project's future operations. The
 model results appear to be unbiased, particularly since other KPAAM cases
 show higher output than PacifiCorp has reported. Using PacifiCorp reported
 output would further increase relicensing costs and the disparity between
 relicensing and decommissioning costs.
- Discount rate This is a dispute over policy perspective and not a flaw or error. No single discount rate is appropriate in all cases; for example, climate change policy analysis requires discounting of future impacts that would have zero value to us under traditional discounting methods. The choice of a discount rate depends on many factors. The rule applied in KPAAM is that the discount rate should be the same as PacifiCorp's weighted average cost of capital. This is the discount rate used by the California and Oregon Public Utilities Commissions and reflected in PacifiCorp's filings before those commissions. CAEC relies on an alternative interpretation presented to the Utah Public Service Commission. Since the Klamath project is in Oregon and California, the former perspective is appropriate, which is why KPAAM uses the same discount rate used by the Public Utilities Commissions in the Klamath project area.

- Tax impacts or benefits Again this is an important avenue for future research identified by CAEC, but it is not a flaw or error in KPAAM and can be addressed with PacifiCorp's future cooperation.
- Site-specific outcomes While the model is not programmed to immediately address every individual change suggested by CAEC, it is flexible enough to look at different decommissioning dates. More importantly, KPAAM can easily import data from new hydrological model runs that reflect different decommissioning scenarios. However, CAEC's comments reflect their lack of understanding of the Project's operations. While Copco 2 seems to have substantial "benefits" from continued operation, it is in fact heavily dependent on the continued operation of both Copco 1 and Irongate and cannot operate alone. For example, removing Irongate from the Klamath project eliminates its re-regulation of operational flows and would subject the entire 300-mile length of the river to environmentally damaging fluctuations in flow and depth levels.

APPENDIX A

Line by Line Summary of Changes to KPAAM2 from the Initial KPAAM Run

<u>Worksheet</u>	<u>Cell</u>	Description
Results Sum Matrix	Row 22	Remove remaining net book value as sunk cost
Scenario Summary	C42	Fall Creek - decommissioned in 2008
MitCostCalc	Row 16-18	Changed rounding from -4 (nearest \$10 M) to -3 (nearest \$1 M)
MitCostCalc	Col K	Corrected real discount rate calculation to remove double subtraction of inflation
MitCostCalc	Col K	Corrected PV to end at the end of license period rather than 30 years
MitCostCalc	C35	Removed "2.5" adjustment factor to low end uncertainty
MitCostCalc	176	Remove Boyle fishladder upgrades
MitCostCalc	L79	Change reference
MitCostCalc	J81	Reduce O&M to \$11,000/yr
MitCostCalc	H/J84	Remove surface collector cost
MitCostCalc	B88	Fixed type of cost
MitCostCalc	Row137	Move temperature control device to Copco 1
MitCostCalc	Rows 139-149	Costs set to zero for Fall Creek as assumed decommissioned.
MitCostCalc	Row 205	East/West decomm. plan removed as sunk cost
MitCostCalc	Rows 259-260	East/West decomm. removed as sunk cost
DecommCalcCost	136-40	Round at 0 (\$ million) to be consistent with other estimates
PowerCostCalc	F7-15, E28-105	Removed CEC Prelim Staff CoG forecast as not vetted
PowerCostCalc	A7-15	Changed labeling for clarity of comparisons
PowerCostCalc	C10-I15	Reversed signs to improve clarity
PowerCostCalc	A80	Relabel for clarity
PowerCostCalc	Rows 96-100	Insert levelized power price forecasts for post decommissioning period.
PowerCostCalc	Q101-106	Added cost of annual O&M saved with decommissioning included in totals
PowerCostCalc	Rows 102-106	Changed forecast price from levelized price for entire license period to post decommissioning period
Power Cases	G13-L19	Added annual O&M costs from FERC Form 1
Wghtd Prices	U/W 46	Removed reference to Fall Creek power values
ReplCostAlts	Col E	Removed CEC Prelim Staff CoG forecast as not vetted
ReplCostAlts	C-D,F14	Changed discount rate to nominal rate consistent with forecast basis
ReplCostAlts	E15	Changed discount rate to real rate consistent with forecast basis
ReplCostAlts	Col O	Corrected NPPC dollar denomination to 2005\$
ReplCostAlts	H8	Expanded reference to US DOI FERC filing in comment
ReplCostAlts	E9	Established Oregon DOE forecast in 2006\$
Gas Price Alts	Col G	Shifted CPUC MPR forecast down to start in 2006